

CLAIMS

1. A power supply device characterized by comprising:
a charging section (20, 50) which is actuated to charge a charging element (24, 54);
a direct-current voltage generation section (30, 60) which generates a second
5 direct-current voltage based on a first direct-current voltage of said charging element (24,
54), and applies the generated second direct-current voltage to a load (L); and
an operation control section (40, 41, 42, 70, 71, 72, 80, 90, 100) which actuates said
charging section (20, 50), determines whether a state of said load (L) to which said
direct-current voltage generation section (30, 60) applies the second direct-current voltage
10 is a lightly loaded state or not, and in a case where determining that said load (L) enters a
lightly loaded state, controls said charging section (20, 50) to stop operation of charging
said charging element (24, 54) when a preset time period elapses after it determines that
said load (L) enters the lightly loaded state.
2. The power supply device according to claim 1, characterized in that the time
15 period from when said load (L) is determined to enter the lightly loaded state to when said
operation control section (40, 41, 42, 70, 71, 72, 80, 90, 100) controls said charging
section (20, 50) to stop the operation is set in advance based on a startup time which is
required from when said charging section (20, 50) is actuated to when the first
direct-current voltage reaches a voltage which appears when said charging section (20,
20 50) operates in a non-lightly loaded state.
3. The power supply device according to claim 1, characterized in that said
operation control section comprises:
a load state detection section (40, 70, 80) which detects a loaded state of said load
(L) and outputs a determination signal representing whether said load (L) is in a lightly
25 loaded state or not;
an output timing setting section (41, 71) which, when said load state detection
section (40, 70, 80) outputs a determination signal representing that said load (L) enters a

lightly loaded state, sets a timing counted from when the determination signal is output and outputs the timing; and

an operation stopping section (42, 72, 90, 100) which controls said charging section (20, 50) to stop the operation of charging said charging element (24, 54) when said output
5 timing setting section (41, 71) outputs a determination signal representing that said load (L) enters a lightly loaded state.

4. The power supply device according to claim 3, characterized in that:

said direct-current voltage generation section (30, 60) is constituted by a switching power supply circuit having a switching element (32); and

10 said load state detection section (40, 70, 80) acquires a control signal for switching on or off said switching element (32), and determines whether said load (L) enters a lightly loaded state or not based on a duty ratio of the acquired control signal.

5. The power supply device according to claim 3, characterized in that said output timing setting section (41, 71) has two thresholds to be compared with level of a
15 determination signal output from said load state detection section (40, 70, 80), and has a hysteresis by a first threshold, compared with level of a determination signal representing that said load (L) enters a lightly loaded state, being set higher than a second threshold, compared with level of a determination signal representing that said load (L) enters a non-lightly loaded state.

20 6. The power supply device according to claim 1, characterized in that said charging section (20, 50) is a power factor improvement circuit comprising:

said charging element (24, 54);

a coil (21, 51);

a switching element (22, 52) which repeats a switching operation of being switched
25 on or off under control of said operation control section (40, 41, 42, 70, 71, 72, 80, 90, 100), and repeatedly flows a switching current corresponding to an input voltage of said coil (21, 51) through said coil (21, 51); and

a diode (23, 53) which rectifies the switching current flowing in accordance with energy stored in said coil (21, 51), and supplies the rectified switching current to said charging element (24, 54).

7. The power supply device according to claim 2, characterized in that the time
5 period from when said load (L) enters the lightly loaded state to when said operation control section (40, 41, 42, 70, 71, 72, 80, 90, 100) controls said charging section (20, 50) to stop the operation is set in a range of 100 μ sec to 10 sec.

8. A method for controlling a power supply device comprising a charging
section (20, 50) which is actuated to charge a charging element (24, 54), and a
10 direct-current voltage generation section (30, 60) which generates a second direct-current voltage based on a first direct-current voltage of said charging element (24, 54) and applies the generated second direct-current voltage to a load (L), characterized by comprising:

a step of determining whether said load (L) is in a lightly loaded state or not; and
15 a step of, in a case where it is determined that said load (L) enters a lightly loaded state, controlling said charging section (20, 50) to stop operation, when the preset time period elapses.